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OPERATING EXPERIENCE WEEKLY SUMMARY

Office of Nuclear and Facility Safety

June 19 - June 25, 1998

Summary 98-25

Operating Experience Weekly Summary 98-25

June 19 through June 25, 1998

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EVENTS

1. ALERT DECLARED FOR PHOSPHORIC ACID SPILL

On June 9, 1998, at the Rocky Flats Environmental Technology Liquid Waste Treatment Facility, a shift superintendent declared an operational emergency alert when facility personnel discovered approximately 2 gallons of radioactive phosphoric acid that had spilled from a tank into a bermed area. He directed emergency operations personnel to secure the area; shelter employees; establish eating, drinking, and smoking restrictions; and sample the liquid. Emergency operations personnel sampled and analyzed the spill and determined that it was phosphoric acid with trace amounts of various metals. Radiological operations personnel surveyed the spill and detected 3,000 dpm of alpha contamination. They also determined that there was no airborne contamination and the spill was contained in the bermed area. Emergency operations personnel covered the spill with absorbent material and placed a tarp over it until the facility manager initiated a cleanup recovery plan. Investigators determined that the tank had been in a high-level alarm condition since at least 1991 and it may have spilled before. Failure to take corrective actions resulted in a radioactive acid spill, an alert declaration, potential exposure of responders to acid fumes, and a potential noncompliance with Resource Conservation and Recovery Act (RCRA) requirements. (ORPS Report RFO--KHLL-LIQWASTE-1998-0002)

Investigators believe that the spill may have been larger, but some of the liquid evaporated, because they noticed a white residue around the spill area. Based on personnel interviews, investigators believe that the liquid had spilled before but was not reported because personnel thought that rainwater had accumulated. Investigators determined that facility personnel waited approximately 15 to 30 minutes before they reported the spill. They also determined that (1) personnel in the spill area did not observe the eating or drinking restrictions after emergency operations personnel made the announcement and (2) some workers who assisted emergency operations personnel were not wearing personnel protective equipment. Investigators were unable to determine the exact cause of the spill.

Investigators determined that the tank became a RCRA permitted tank in 1996. They also determined that the tank was improperly permitted because it did not meet the RCRA requirements due to the high-level alarm condition. They are investigating to determine how the tank became permitted and whether the high-level alarm noncompliance was reported to the State of Colorado as required by procedures. Investigators also determined that no one took action to resolve the high-level alarm condition even though facility personnel are required to take corrective actions when overfill prevention alarms are inoperable. Investigators also identified the following deficiencies.

- No one performed a hazard evaluation or a safety evaluation for long-term storage of the acid.
- No one adequately monitored the tank or the acid to ensure a safe configuration was maintained.
- Facility managers failed to take actions to correct the high-level alarm condition.
- Facility managers failed to implement corrective actions based on lessons learned from the 1997 Hanford chemical explosion event.

- Facility personnel were not sufficiently trained to recognize a spill, properly report it, or respond to it.

The facility manager will determine whether the long-term storage of the acid in the tank was within the safety authorization basis and will develop corrective actions. The State of Colorado has scheduled a site visit to observe the spill area.

NFS has reported chemical spills in several Weekly Summaries. Following are some examples.

- Weekly Summary 97-49 reported that two 55-gallon drums of phosphoric acid ruptured and spilled onto the floor of a storage cell area at Pacific Northwest National Laboratory. Waste management personnel determined that the drums overpressurized, ruptured, and spilled approximately 100 gallons of acid into sumps used for spill control. They also determined that workers mixed incompatible materials (phosphoric acid and metal) that caused a chemical reaction in the drum. (Weekly Summary 97-32; ORPS Report RL--PNNL-PNNLBOPER-1997-0022)

- Weekly Summary 97-21 reported that on May 14, 1997, a chemical explosion occurred and caused significant localized damage at the Hanford Plutonium Reclamation Plant in a room where non-radioactive bulk chemicals were mixed. Investigators determined that the explosion occurred in a tank that contained a solution of hydroxylamine nitrate and nitric acid. The tank initially contained a relatively dilute solution of hydroxylamine. However, because the tank was vented, evaporation caused the concentration of the reactants to increase over time and resulted in a spontaneous chemical reaction that generated large quantities of steam and gas that overpressurized the tank. (ORPS Report RL--PHMC-PFP-1997-0023)

The Secretary of Energy issued “DOE Response to the May 14, 1997, Explosion at Hanford’s Plutonium Reclamation Facility” on August 4, 1997. This memorandum states: “DOE field offices must reassess known vulnerabilities (chemical and radiological) at facilities that have been shut down, are in standby, are being deactivated, or have otherwise changed their conventional mode of operation in the last several years.” It also states: “DOE and contractor field organizations must assess the technical competence of their staffs to recognize the full range of hazards presented by the materials in their facilities, act on results, and implement training programs where needed.” The Secretary of Energy also issued “Assessment of Hazards Associated with Chemical and Radioactive Waste Storage Tanks and Ancillary Equipment” on October 31, 1997. This memorandum states that DOE offices should ensure that all waste storage tanks are identified, fully characterized, and addressed.

These events underscore the dangers associated with stored waste material that can result in spills, chemical reactions, or pressurization of storage containers. Facility safety precautions and emergency procedures should provide workers with the necessary information to ensure accurate and complete safety and hazard evaluations. Personal protective equipment must be selected in accordance with the magnitude of the hazard, and training must be provided in the proper use of the equipment. Facility managers should emphasize the importance of researching all available sources of chemical safety information, especially when the chemical will be stored for long periods of time.

These events also highlight the need for comprehensive lessons learned programs. If facility managers had incorporated lessons learned from the Hanford tank explosion event, this event could have been prevented. Chemical spills have been reported many times throughout the DOE complex. One objective of investigating and reporting the cause of occurrences is to identify corrective actions to prevent recurrence and thereby protect the health and safety of the public, workers, and environment. DOE M 232.1-1, *Occurrence Reporting and Processing of Operations Information*, requires trending and analysis of occurrence information for early identification and correction of deteriorating conditions. The manual also requires dissemination of operations information, including lessons learned.

Lessons learned are valuable only if the information they communicate is used. DOE-STD-7501-95, *Development of DOE Lessons Learned Programs*, was designed to promote consistency and compatibility across programs. Both lessons learned managers and program managers should review the standard and incorporate applicable elements into their site programs. Managers, supervisors, and operators should review lessons learned documents for applicability, and the information should be used to improve operations.

Facility managers should review the following for additional chemical information.

- DOE/EH-0396P, *Chemical Safety Vulnerability Working Group Report*, and DOE/EH-0398P, *Chemical Safety Vulnerability Management Response Plan*, address the development and implementation of management systems and other administrative controls that can significantly reduce overall hazardous chemical inventories. These reports identify generic chemical vulnerabilities at DOE facilities. The working group report also includes information that can aid personnel responsible for chemical cleanup. These documents are available to DOE and DOE contractors from the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831, (615) 576-8401. These documents are available to the public from the Department of Commerce, Technology Administration, National Technical Information Service, Springfield, VA 22161, and (703) 487-4650.

- DOE-HDBK-1100-96, *Chemical Process Hazards Analysis,* February 1996, and DOE-HDBK-1101-96, *Process Safety Management for Highly Hazardous Chemicals,* February 1996, provide guidance for DOE contractors managing facilities and processes covered by the Occupational Safety and Health Administration (OSHA) Rule for Process Safety Management of Highly Hazardous Chemicals (29 CFR 1910.119). Both handbooks are available on the Department of Energy Technical Standards Home Page at URL http://www.doe.gov/html/techstds/standard/standard.html.

- OSHA Regulation 29 CFR 1910.119, *Process Safety Management of Highly Hazardous Chemicals,* contains the requirements for preventing or minimizing the consequences of catastrophic releases of toxic, reactive, flammable, or explosive chemicals. OSHA Regulation 29 CFR 1910.119 is available on the OSHA Home Page at URL http://www.osha-slc.gov/OshStd_data.

The Chemical Safety Vulnerability Working Group Report and Management Response Plan, as well as other chemical safety references, can be found at the DOE Chemical Safety Program Home Page at URL http://tis.eh.doe.gov:80/web/chem_safety/.

KEYWORDS: chemicals, chemical safety and vulnerability studies, emergency, acid

FUNCTIONAL AREAS: Chemistry, Industrial Safety, Materials Handling and Storage, Licensing/Compliance

2. WORKER SHOCKED WHILE CLEANING RESISTANCE FURNACE OVEN

On June 11, 1998, at the Los Alamos National Laboratory Materials Science Complex, a technician received a mild shock when he cleaned dust from the outside surface of a resistance furnace oven. Investigators determined that the technician completed a 110-volt circuit when one of his hands contacted the oven chassis while the other was on another grounded device. The technician did not think he was injured, so he unplugged the oven and reported the event to the building manager by electronic mail. The building manager received the message the following day and directed the technician to report to occupational medicine personnel for evaluation. Medical personnel confirmed that the technician had not been injured. The building manager also directed an electrical inspector to inspect the oven. The inspector determined that someone had modified the main power cord ground wire, creating an electrical hazard. Unidentified electrical hazards have the potential to cause severe injuries or a fatality. (ORPS Report ALO-LA-LANL-MATSCCMPLX-1998-0002)

Investigators determined that Materials Science Complex personnel functionally tested the resistance furnace oven and used it over the last year. However, the tests did not include completing a circuit with the main-power-cord ground wire, and no one detected the hazard. Investigators also determined that previous users in another division modified the plug for electrical sintering operations, but did not document the modification. The electrical inspector determined that the main oven controller power cord consisted of four wires and a ground. He determined the previous division owners had (1) severed the main power cord ground wire at two locations, (2) cut the ground wire where it connected to the oven, and (3) used the third-phase wire (which connects to the oven chassis) as a ground. The inspector determined that this allowed current to flow through the technician when he completed the circuit. The inspector also determined that the oven did not have an Underwriters Laboratory rating.

The facility manager held a critique of the event. Critique members learned that site electrical safety requirements are unclear about when personnel should report electrical shocks and to whom. They also learned that site policies and procedures do not address equipment obtained from someone other than a manufacturer. The facility manager determined that facility personnel may have no knowledge of modifications made to equipment if it has been obtained from someone other than the manufacturer and that these potential modifications could affect equipment operating capabilities as well as personnel safety. The division director alerted the Laboratory Leadership Council about the event and directed facility personnel to implement a policy to certify that equipment is electrically safe unless it is purchased directly from a manufacturer and contains the appropriate Underwriters Laboratory rating.

NFS has reported on electrical shocks in several Weekly Summaries. Following are some examples.

- Weekly Summary 98-04 reported two events where personnel received electric shocks at the Sandia National Laboratory. On January 16, 1998, a technician received an electrical shock while replacing a test circuit. On January 22, 1998, another technician received an electrical shock while cleaning support fixtures on a Mini-Marx generator. (ORPS Reports ALO-KO-SNL-14000-1998-0001 and ALO-KO-SNL-9000-1998-0002)

- Weekly Summary 97-45 reported that a technician received a shock from a partially charged capacitor when he removed a cable from a fixture in a fluorinert-filled test tank. The technician inadvertently touched the coax connector shell at one end of the cable to a resistor in the circuitry while his hand was on the tank. This completed the circuit to ground and allowed the capacitor to discharge. Investigators determined that a designer added the capacitor to upgrade the system 3 months earlier and did not revise procedures to reflect the upgrade. (ORPS Report ALO-KO-SNL-1000-1997-0008)

These events illustrate the importance of practicing proper change control and configuration control when equipment modifications are performed. A good configuration control process requires modification testing to ensure that systems continue to perform as required and that safety hazards are not introduced. In this event, personnel tested the equipment to ensure it functioned properly, but failed to ensure that it was safe. In addition, the personnel who acquired the oven were unaware that it had been modified. If the previous owners of the oven had documented the modification or installed a label to indicate that it had been modified, this event could have been prevented. Correct and current information must be translated into procedures and evaluated when modifications are made to systems or components. This guidance must be technically accurate, complete, and up-to-date and must be presented in a clear, concise, and consistent manner that minimizes human error.

These events also illustrate the importance of using equipment that has been designed and approved specifically for the work application and work environment. Laboratory managers and supervisors should ensure that equipment and tools used in the laboratory are (1) approved for use, (2) operated as designed, (3) maintained properly, and (4) inspected periodically.

OEAF engineers reviewed selected occurrences from the ORPS database from October 1, 1990, through March 31, 1998, for hazardous electrical occurrences (with the causes determined) and found 771 reports. More than half of the occurrences had a root cause of either management problem or personnel error. About 27 percent of the management problems resulted from inadequate administrative control; 25 percent resulted from inadequate policy dissemination and enforcement; and about 25 percent resulted from work-planning deficiencies. About 41 percent of the personnel errors involved inattention to detail, and 40 percent involved procedure not used or used incorrectly. Taken together, the data indicates that nearly 72 percent of all occurrences could be eliminated by a well-trained, well-managed, attentive workforce using good procedures. Figure 2-1 shows the distribution for hazardous electrical occurrences.

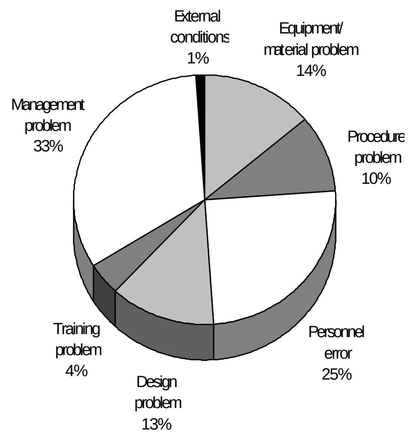

Figure 2-1. Root Causes of Hazardous Electrical Occurrences[1]

Managers and supervisors in charge of job performance should ensure that hazards are identified and corrected. DOE facility managers should ensure that personnel understand the basics of work control practices and safety and health hazard analyses. Personnel in charge of system design changes should ensure that facility documentation, including procedures and drawings, is updated and accurate.

- DOE O 5480.19, *Conduct of Operations Requirements for DOE Facilities*, chapter VIII, "Control of Equipment and System Status," states that DOE facilities are required to establish administrative control programs to handle configuration changes resulting from maintenance, modifications, and testing.

- DOE/ID-10600, *Electrical Safety Guidelines*, prescribes electrical safety standards for DOE field offices and facilities. Included in the guidelines is information on training and qualifications, work practices, protective equipment, insulated tools, and recognition of electrical hazards. In July 1996, prompted by the recurrence of incidents across the DOE complex involving actual or potential electrical shock incidents, the Office of Defense Programs issued a safety information letter, SIL 96-03, "Electric Shock." This publication describes nine representative events chosen to illustrate the hazards of unexpected exposure to electricity. DOE facility managers, facility representatives, and contractor facility managers should continue to emphasize the dangers and life-threatening characteristics of uncontrolled electricity.

[1] OEAF engineers performed several interactive narrative searches for electrical events and developed data based on a review of 794 occurrences from October 1, 1990, through March 31, 1998. Review of the reports identified 771 reports (with the causes determined) that we classified as hazardous electrical occurrences.

- DOE-STD-1073-93-Pt.1 and –Pt.2, *Guide for Operational Configuration Management Programs, Including the Adjunct Programs of Design Reconstitution and Material Condition and Aging Management*, provides guidelines and good practices for an operational configuration management program including change control and document control.

- DOE-HDBK-1092-98, *Electrical Safety*, states that any electrical shock should be classified as an injury and reported immediately to health services and supervision.

- The *Hazard and Barrier Analysis Guide*, developed by OEAF, discusses barriers that provide controls over hazards associated with a job. Barriers may be physical barriers, procedural or administrative barriers, or human action. The reliability of barriers is important in preventing undesirable events such as shocks. The reliability of a barrier is determined by its ability to resist failure. Barriers can be imposed in parallel to provide defense-in-depth and to increase the margin of safety. The *Hazard and Barrier Analysis Guide* provides a detailed analysis for selecting optimum barriers, including a matrix that displays the effectiveness of different barriers in protecting against some common hazards.

A copy of the *Hazard and Barrier Analysis Guide* is available by contacting the ES&H Information Center, (800) 473-4375, or by writing to U.S. Department of Energy, ES&H Information Center, EH-72, 19901 Germantown Road, Germantown, MD 20874. A copy can also be found at URL http://tis.eh.doe.gov:80/web/oeaf/tools/hazbar.pdf.

KEYWORDS: electrical shock, laboratory, oven, electrical hazard

FUNCTIONAL AREAS: Industrial Safety, Configuration Control, Hazards and Barrier Analysis

3. INADEQUATE DECOMMISSIONING WORK PLANNING RESULTS IN DEGRADATION OF TRITIUM MONITORS

On June 16, 1998, at the Mound Plant Tritium Facilities, personnel investigating a tritium monitor alarm light discovered that decommissioning workers had cut the vacuum piping for the tritium monitoring system. Investigators discovered that work planners did not identify utilities boundaries and that workers cut the tritium monitor pipes approximately 2 weeks before investigators identified the problem. Communications center personnel received an alarm indication on June 15, 1998, and checked the tritium monitoring system. The monitoring system indicated "all clear," so they did not notify operations personnel. Inadequate decommissioning planning resulted in degradation of tritium monitoring and reduced the facility safety margin for mitigating the effects of tritium releases. (ORPS Report OH-MB-BWO-BWO01-1998-0009)

Investigators determined that a backup tritium monitor pump was able to provide enough flow to satisfy the alarm logic and indicate an "all clear" when communications center personnel received an alarm. They also found that decommissioning workers followed generic procedures that required them to remove all equipment and pipes. The procedures provided little guidance or direction because work planners believed the work did not require extensive guidance or direction. None of the equipment in the room being decommissioned was identified to workers as being active. The Tritium Facilities manager ordered workers to repair the pipes and placed an administrative hold on all activities unrelated to limiting conditions for operations or safety issues. The manager is developing additional corrective actions for decommissioning work planning.

NFS has reported events involving inadequate work planning in several Weekly Summaries. Following are some examples.

- Weekly Summary 97-37 reported that alarm technicians at Rocky Flats inadvertently actuated a plenum deluge system while performing an annual battery load-test on a fire panel, releasing 2,000 gallons of water into the plenum and 500 gallons of water into adjacent contamination areas. Investigators determined that the technicians used a generic procedure, supplemented by an uncontrolled list of the associated systems connected to the tested alarm points. They also determined that the technicians failed to isolate the plenum deluge system because it was not identified on the list. (ORPS Report RFO--KHLL-NONPUOPS1-1997-0009)

- Weekly Summary 97-22 reported that a DOE vendor mistakenly removed operational equipment from a reactor material facilities building at the Savannah River Site during disassembly and removal of surplus extrusion press equipment. Investigators determined the cause of this event was inadequate identification of the associated equipment to be removed. Facility personnel assumed that identification of excessed equipment in the building would be obvious to the vendor. (ORPS Report SR--WSRC-RMAT-1997-0006)

This event is important because of the increasing number of DOE facilities that are transitioning to decontamination and decommissioning activities. Managers at DOE facilities undergoing decommissioning need to ensure that workers understand the scope of work. This can be accomplished by (1) clearly defining the scope of the work and accurately identifying the equipment, (2) conducting walk-downs of the work, (3) marking or tagging affected equipment, and (4) checking the work performed against a list. Managers should review their administrative work controls because of the many configuration changes that take place during decommissioning. Work controls are important during decommissioning because the workforce is usually not familiar with plant structures, systems, and components. Decommissioning work planners should consult the following references.

- DOE-STD-1073-Pt.1, *Guide for Operational Configuration Management Program*, section 1.4.2.3, states that managers of facilities in a deactivation mode should track changes and provide documentation of the structures, systems, and components that remain in the facility. Limited walk-downs of the facility should be conducted to confirm that the configuration shown on the associated documentation is accurate. Physical changes should be identified and documented.

- DOE/EM-0142P, *Decommissioning Handbook*, March 1994, DOE Office of Environmental Management, is primarily a decommissioning technology identification document and refers the reader to many important elements of decommissioning projects.

- DOE/EM-0246, *Decommissioning Resource Manual,* August 1995, DOE Office of Environmental Management, provides another reference resource for decommissioning projects.

KEYWORDS: equipment, labeling, decontamination and decommissioning, work control

FUNCTIONAL AREAS: Decontamination and Decommissioning, Work Planning

4. RADIOGRAPHY CONTROL VIOLATIONS

This week OEAF engineers reviewed two recent events where personnel did not adhere to established radiography control requirements. On June 5, 1998, at the Savannah River Site, a facility operator entered a barricaded area where radiography was being performed. A radiography technician directed the operator to egress from the area; stopped radiography; and notified radiological control operations personnel, who determined that the operator received no exposure from the radiography. Investigators determined that inadequate communication between the radiography technician and the operator resulted in the operator incorrectly assuming he could pass through the barricaded area without an escort. On June 10, 1998, at the Los Alamos National Laboratory Pajarito Laboratory, researchers failed to make proper notifications, post an exclusion area, or activate warning lights before conducting a radiography experiment. Two security officers posted in an unshielded area behind the building received a potential unattenuated dose of approximately 1 millirem. Investigators determined that the researchers failed to follow the procedure for the experiment. These events are significant because radiography sources can create radiation fields in which permissible occupational dose standards can be exceeded in a short time. (ORPS Report SR--WSRC-TRIT-1998-0007 and ALO-LA-LANL-TA18-1998-0006)

At the Savannah River Site, radiography technicians established a posted, barricaded area within a building to limit access to the area while they radiographed piping. A facility operator asked the radiography technician to let him pass through the barricaded area to access a control room. The technician escorted the operator to the control room when no radiography was in progress, left him at the room, and resumed radiographic work. After several minutes, the operator left the control room, observed that the technician was gone, and began retracing his path through the barricaded area. The technician was conducting a 42-second exposure using a 15-curie source when he saw the operator pass through the barricaded area. He directed the operator to a nearby shielded stairwell, stopped radiography, and escorted the operator to the radiological control operations office to report the incident. Radiological control operations personnel determined that the operator had no dosimetry. They analyzed the technician's dosimetry, characteristics of the radiograph (including direction of the source beam), and the operator's path and determined that the operator did not receive an exposure. Investigators determined that the operator believed the technician had authorized his unescorted return through the barricaded area. The facility manager directed staff to revise and strengthen the facility radiography barricade access policy to reduce the potential for inadequate communications and to ensure positive access control is maintained during radiography work.

At Los Alamos, experimenters directed a focused, highly directional, 6 MeV betatron high-energy beam on materials inside a building at an exposure rate of 2 roentgen per minute, at 1 meter, for approximately 15 minutes. After they completed the first radiograph, they turned on the warning lights. Two security officers posted in vehicles in an unshielded area behind the building observed activation of the warning lights outside the building. They informed facility guard station officers, who directed the two security officers to relocate to appropriate positions. A third security officer posted within shielded boundaries also relocated. The lead experimenter calculated that the two officers posted in the unshielded area received a potential unattenuated dose of approximately 1 millirem from the radiography. Investigators determined that the security officers outside the building and in the facility guard station were not aware that the experiment was in progress until the radiographers turned on the lights after the first radiograph was taken. Investigators also determined that the experiment procedure requires notifying the guard station, posting the exclusion area with ropes, and activating the building warning lights before activating the radiography equipment. Facility managers placed betatron radiography operations in stand-down. They also directed staff to review the operating procedure for the radiography experiment and revise it to include provisions (including the use of a logbook checklist) that ensure all required procedure steps are followed.

NFS has reported similar events involving inadequate radiological controls in several Weekly Summaries. Following are some examples.

- Weekly Summary 95-06 reported two events involving improper personnel entries into radiography areas. On February 1, 1995, an employee at Los Alamos National Laboratory misinterpreted a posting and entered a radiography exclusion area in violation of posting requirements. The employee could have received a dose of approximately 200 millirem if the radiography equipment had been operating while he was in the area. Also, on February 1, 1995, a tank operator entered a radiography area to operate equipment at the Savannah River In-Tank Precipitation Facility. Facility personnel determined that the barricade was inadequate and allowed access to the radiography area through an unbarricaded entrance point. Radiography was not in progress in either incident and no personnel exposures were incurred. (ORPS Reports ALO-LA-LANL-TRITFACILS-1995-0002 and SR--WSRC-ITP-1995-0003)

- Weekly Summary 94-12 reported that an operator at the Savannah River Site violated a radiological controls barricade when he entered an area while radiography was in progress. The radiography boundary was not consistent with normal Savannah River radiological boundary practices. Investigators determined that the site did not have a radiological procedure to govern radiography work. (ORPS Report SR--WSRC-FCAN-1994-0019)

- Weekly Summary 92-23 reported that a worker at the Savannah River Site passed through an emergency door exit and into a room where radiography was in progress. Investigators determined that the emergency door was not properly posted and that the worker had not been informed that radiography would occur in the room and did not hear a public address announcement that radiography was in progress. (ORPS Report SR--WSRC-REACK-1992-0211)

NFS also reported in Weekly Summary 93-37 on three events involving unauthorized entries into radiography areas at commercial nuclear power plants, as detailed in Nuclear Regulatory Commission Information Notice 93-69, *Radiography Events at Operating Power Reactors*, September 2, 1993.

Events involving loss of administrative control during radiography are significant because radiography sources can create extremely high radiation fields in which allowable dose limits can be exceeded in a short time. These events underscore the importance of good communication and verification that radiography exclusion areas are completely barricaded, clearly marked, and cleared of personnel. Exceptions to procedures and controls should not be made because they can lead to misunderstanding and a diminished respect for barriers to hazards. Although doses to personnel were insignificant in some of these events, more serious exposures could have occurred if the timing had been different or if personnel had been closer to the radiography source.

Facility managers should ensure that employees understand their responsibility for complying with procedures and observing postings and barricades established for radiography. Facility managers and radiation protection managers should ensure radiological procedures are complete and accurate. They should also ensure that facility personnel are fully briefed about radiography activities that may be performed at a site or facility and on the steps employees should take to avoid to unplanned exposure.

Facility and radiation protection managers at facilities where radiography or other operations of radiation generating devices may occur should review their facility program compliance with the following articles in DOE/EH-0256T, *DOE Radiological Control Manual,* Part 1.

- Article 365, "Radiation Generating Devices," specifies the requirements related to operation and control of radiation generating devices. It requires stringent physical and administrative control of radiography sources to prevent over-exposure to operating and support personnel and those in adjacent work areas. Article 365 incorporates related requirements by reference to the following documents: (1) DOE O 5480.4*, Environmental Protection, Safety, and Health Protection Standards*; (2) ANSI N43.3, *American National Standard for General Radiation Safety – Installations Using Non-Medical X-Ray and Sealed Gamma-Ray Sources, Energies up to 10MeV*; (3) ANSI N43.2, *Radiation Safety for X-Ray Diffraction and Fluorescence Analysis Equipment*; and (4) 10 CFR 34, *Licenses for Radiography and Radiation Safety Requirements for Radiographic Operations*.

- Article 655, "Radiographers and Radiation-Generating Device Operators," contains training and qualification requirements for radiographers and radiation-generating device operators. It states that radiographers should be trained in accordance with 10 CFR 34.31 and that radiation-generating device operators should have training appropriate for the radiation source involved and commensurate with the level described in 10 CFR 34.31. Article 655 incorporates related requirements by reference to DOE O 5480.4, *Environmental Protection, Safety, and Health Protection Standards*, which mandates the use of ANSI N43.3, *American National Standard for General Radiation Safety – Installations Using Non-Medical X-Ray and Sealed Gamma-Ray Sources, Energies up to 10 MeV*, for operations involving the irradiation of materials.

KEYWORDS: barricade, exclusion area, radiography, posting

FUNCTIONAL AREAS: Training and Qualifications, Radiation Protection, Procedures

5. VIOLATION OF FACILITY RADIOLOGICAL INVENTORY OPERATIONAL CONTROLS AT THE MOUND PLANT

On June 16, 1998, at the Mound Plant, the facility manager confirmed a violation of a Basis for Interim Operation (BIO) administrative control for radiological inventory while reviewing facility operational controls. The facility is controlled as a Category 3 facility as defined by DOE STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*. DOE field office managers requested a reduction in the inventory limits for radionuclides listed in the BIO to reduce dose consequences for on-site personnel. Accordingly, BIO authors set the facility storage limit at 200,000 Curies for tritium, 6.2 curies for plutonium-238, and 10 percent of the Category 3 threshold for the sum of the ratios of all other radionuclides. However, the computer-based inventory control system for the facility was programmed (correctly) to allow a limit of 10 percent of the Category 2 threshold for the sum of the ratios of all other radionuclides. This resulted in the facility receiving amounts of plutonium-239 that violated the BIO limit for all other radionuclides. Category 3 limits specified in DOE STD-1027-92 were never exceeded. There were no personnel injuries or impacts to the environment as a result of this occurrence. In this case the inventory differences were small, however, errors in radionuclide inventory limit controls could result in severe personnel exposures to hazardous levels of radionuclides in the event of an accident. (ORPS Report OH-MB-BWO-BWO06-1998-0004)

DOE O 5480.23, *Nuclear Safety Analysis Reports*, requires contractors to analyze and categorize hazards at their facilities. The Order identifies three levels of hazards.

- Category 1 — The hazard analysis shows the potential for significant off-site consequences.
- Category 2 — The hazard analysis shows the potential for significant on-site consequences.
- Category 3 — The hazard analysis shows the potential for only significant localized consequences.

NFS has reported similar events concerning violations of facility radiological inventory limits in past Weekly Summaries.

- Weekly Summary 97-07 reported that workers at a Fernald facility moved slightly enriched uranium into the storage building, violating the nuclear material mass limit for the building. The storage building was categorized as non-nuclear. Investigators determined that building managers did not know the storage limits specified in DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23*, *Nuclear Safety Analysis Reports*. (ORPS Report OH-FN-FDF-FEMP-1997-0006)

- Weekly Summary 97-07 also reported that investigators at the Hanford Fast Flux Test Facility determined that a warehouse contained nuclear material in excess of DOE-STD-1027-92 limits. Facility personnel conducted an inventory check of depleted uranium in the building after reviewing a report in Weekly Summary 96-50 involving a violation of the standard at the Pantex Plant (ALO-AO-MHSM-PANTEX-1996-0235). Engineers prepared a Justification for Continued Operation until the final disposition of the depleted uranium was determined. (RL--PHMC-400NE-1997-0001)

This occurrence underscores the importance of nuclear material inventory controls. Managers responsible for storage and handling of nuclear materials should ensure that their facility safety documentation accurately reflects requirements from which they are derived. They should review their programs to determine exact requirements for storage of nuclear material and should disseminate this information to the custodians of the material. They should also ensure that requirements are properly reflected in facility basis documents and procedures and ensure that the program to revise basis documents and procedures is rigorous and systematic to ensure all changes to requirements, inventories, facility physical changes, and facility mission changes are captured in revisions to procedures.

DOE-STD-1027-92 provides guidance for determining the hazard category of a facility. Attachment 1 of the standard provides threshold values for various radionuclides. If the quantity of material (in curies or grams) exceeds the threshold value, the facility should be categorized at the next highest level. Facilities that meet or exceed Category 3 thresholds must comply with DOE O 5480.23. DOE STD-1072-92 specifies that facilities or facility segments that have combinations of radioactive materials should be designated as Category 2 or 3 if the sum of the ratios of the quantity of each isotope to the Category 2 or 3 thresholds exceeds 1.0.

KEYWORDS: inventory control, radioactive material, storage

FUNCTIONAL AREAS: Materials Handling/Storage, Nuclear/Criticality Safety, Radiation Protection

1998 OEWS READER SURVEY

Following is the 1998 OEWS Reader Survey. The responses to the previous surveys were extremely valuable in helping us understand the needs of our customers and chart the course for the OEWS and other OEAF products. We again request your participation to help us learn more about our readership and what you think is valuable. We firmly believe that understanding your needs and perceptions is crucial to ensuring that the OEWS and other OEAF products are useful, quality products that have real benefits to you and the DOE.

Please help us help you by completing the survey and mailing or faxing it to:

Mr. I-Ling Chow, U.S. DOE
c/o Research Planning, Inc.
20251 Century Boulevard
Germantown, MD 20874
Phone: (301) 540-2396 Fax: (301) 540-2499

Or, if you prefer, an electronic copy of the survey is available for your convenience along with OEWS 98-25 at URL http://tis.eh.doe.gov/web/oeaf/oe_weekly/oe_weekly.html.

OEAF plans to provide information on the results of the survey in a future OEWS. Thank you in advance for your participation.

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1. What is your job title?

   - ? Facility Manager
   - ? Report Originator
   - ? Facility Representative
   - ? Program Manager
   - ? Other Manager
   - ? Engineer/Analyst
   - ? Supervisor
   - ? Instructor
   - ? Technician
   - ? Other/please enter your title_________________________________

2. In which department do you usually work?

   - ? Criticality Safety
   - ? Facility Operations
   - ? Industrial Hygiene
   - ? Maintenance
   - ? Radiation Protection/Health Physics
   - ? Industrial Safety
   - ? Nuclear Safety
   - ? Operating Experience Analysis/Lessons Learned
   - ? Training
   - ? Quality
   - ? Security
   - ? Engineering/Technical Support
   - ? Other/please specify___________________________________

3. How long have you been in your current position?__________________

4. How many total years of experience do you have?_________________

1998 OEWS READER SURVEY

5. Who is your employer?

    ? DOE
    ? Department of Transportation (DOT)
    ? Operating Contractor for DOE
    ? Other Contractor to DOE
    ? Subcontractor to an Operating Contractor
    ? Nuclear Regulatory Commission (NRC)
    ? Environmental Protection Agency (EPA)
    ? Occupational Safety and Health Administration (OSHA)
    ? Other Federal Government
    ? State Regulatory Agency
    ? Commercial Nuclear Utility
    ? University
    ? Medical Facility
    ? Other (please enter your organization)_______________________________________

6. Does your facility or organization (e.g., company, office, site) have a lessons-learned program?

    ? Yes
    ? No (Proceed to Question 11)

7. If yes, would you describe the program as formal (i.e., written guidance or procedures)?

    ? Yes
    ? No (Proceed to Question 11)

8. If yes, does the program include identification of specific corrective actions from reviewing operating experience/lessons-learned documents that may be applied to your facility?

    ? Yes
    ? No (Proceed to Question 11)

9. If yes, does the program include tracking the identified corrective actions?

    ? Yes
    ? No (Proceed to Question 11)

10. If yes, does the program track the effectiveness of the corrective actions?

    ? Yes
    ? No

11. Does your facility have a lessons-learned coordinator or point-of-contact?

    ? Yes
    ? No

Name: ________________________________

Facility: ________________________________

Dept./Organization: ________________________________

Phone Number: ________________________________

Email Address: ________________________________

1998 OEWS READER SURVEY

12. Do you have formal distribution of the OEWS within your organization?

    - ? Yes
    - ? No

13. What is the physical appearance of the OEWS when it arrives?

    - ? Acceptable
    - ? Unacceptable

14. Do you share your copy of the OEWS?

    - ? Yes, with ___ people
    - ? No

15. How often do you read the OEWS?

    - ? Every week
    - ? Every other week
    - ? Once a month
    - ? Less frequently than once a month

16. How do you use the OEWS in your job (check all that apply)?

    - ? Corrective Actions Program
    - ? Industrial Safety Program
    - ? Job Planning
    - ? Lessons Learned Program
    - ? Nuclear Safety Program
    - ? ORPS Preparation
    - ? Training Program
    - ? Other/please specify (e.g., teaching materials) ________________________________

17. How useful in your job are the articles in the OEWS?

    - ? Very useful (e.g., at least one article in every issue is pertinent to your job)
    - ? Somewhat useful (e.g., one article in every 4/5 issues is pertinent to your job)
    - ? Rarely useful (e.g., only one article used each quarter)
    - ? Never useful

18. Do you believe the OEWS has contributed to improved safety performance at your site?

    - ? Yes
    - ? No

19. Do the articles in the OEWS contain sufficient information?

    - ? Yes
    - ? No (If no, what information do you feel should be included?)

    ____

    ____

20. On average, the length of the OEWS articles is:

    ? Too long (Many articles contain extraneous information and take too long to read.)
    ? Acceptable length (Most articles contain only pertinent information.)
    ? Too short (Most articles are missing pertinent information.)

21. How easy to understand are the articles in the OEWS?

    ? Too difficult (The writing is complex; many technical terms are not adequately defined.)
    ? Acceptable (The writing is clear; technical terms are adequately defined.)
    ? Too tedious (The writing is simplistic; too many common technical terms are defined.)

22. How useful are the "DOE Guidance" sections of OEWS articles (usually the last paragraph or two of the articles)?

    ? Very useful
    ? Somewhat useful
    ? Rarely useful
    ? Never useful

23. How useful are the suggested actions given in the OEWS articles?

    ? Very useful
    ? Somewhat useful
    ? Rarely useful
    ? Never useful

24. How useful are the following parts of OEWS articles when they are included?
    ("0" = Not Useful, "5" = Very Useful)

Description of event and significance (first paragraph)	0	1	2	3	4	5	
Details of event (second paragraph)	0	1	2	3	4	5	
Investigation and causes of event	0	1	2	3	4	5	
Corrective actions	0	1	2	3	4	5	
Similar events	0	1	2	3	4	5	
Regulatory guidance	0	1	2	3	4	5	
Key words	0	1	2	3	4	5	
Functional areas	0	1	2	3	4	5	
Trend of similar occurrences (graph)	0	1	2	3	4	5	
Causes of similar occurrences (graph)		0	1	2	3	4	5
Distribution of similar occurrences by field office (graph)	0	1	2	3	4	5	

Photograph of occurrence scene	0	1	2	3	4	5	
Floor plan of occurrence scene		0	1	2	3	4	5
Drawing or photograph of equipment	0	1	2	3	4	5	

25. Some of the information presented in an OEWS article is based on the investigation and critique of the occurrence. Because new information may be uncovered during the investigation, there is a trade-off between the timeliness of an article and attributes such as completeness and depth of analysis. For each attribute in the pairs below, circle the one that is most important to you in an OEWS article. If you prefer timeliness versus completeness, circle timeliness. If you prefer depth of analysis versus timeliness, circle depth of analysis.

    Timeliness **Completeness**

    Timeliness **Depth of Analysis**

26. How frequently should DOE publish the OEWS?

    ? Once a week
    ? Once every two weeks
    ? Once per month
    ? Other/Please specify____

27. Since you have been receiving the OEWS, has the overall quality/usefulness:

    ? Increased
    ? Decreased
    ? No change
    ? Don't know

28. Over the last year, has the overall quality/usefulness:

    ? Increased
    ? Decreased
    ? No change
    ? Don't know

29. Which of the following subjects do you think should be covered in the OEWS?
    ("0" = Never include, "3" = OEWS covers the subject sufficiently, "5" = Include more frequently)

Criticality Safety	0	1	2	3	4	5
Industrial Safety	0	1	2	3	4	5
Transportation	0	1	2	3	4	5
Radiation Protection	0	1	2	3	4	5
Work Control	0	1	2	3	4	5
Conduct of Work	0	1	2	3	4	5

Conduct of Operations	0	1	2	3	4	5
Training	0	1	2	3	4	5
Engineering & Design	0	1	2	3	4	5
Lessons Learned from Commercial Nuclear Utilities	0	1	2	3	4	5
Operating Experience Analysis	0	1	2	3	4	5
Nuclear Safety	0	1	2	3	4	5
Good Practices	0	1	2	3	4	5
Cost-Beneficial Activities	0	1	2	3	4	5
Emergency Planning/ Environmental Protection	0	1	2	3	4	5
Other/please specify____						

30. How would you improve the OEWS (what are important attributes the OEWS should have but are currently lacking/inadequate)?

____

____

31. Should DOE periodically publish an index of OEWS article titles to help find past articles of interest to readers?

    ? Yes
    ? No (Proceed to Question 33)
    ? Not sure (Proceed to Question 33)

32. If yes, which index subjects would be most useful (check all that apply)?

    ? ? OEWS article title
    ? ? Facility where event occurred
    ? ? Subject of article (key words)
    ? ? All of the above

33. What other Operating Experience or lessons learned products would be useful to your facility?

____

34. In your opinion, is there a need for another Operating Experience product which is published:

- ? Monthly
- ? Quarterly
- ? Semi-annually
- ? Annually
- ? No need

35. Do you have any suggestions for content, format, medium, length, distribution, focus, etc.?

____

____

36. In your opinion, would a periodic publication highlighting outstanding programs at DOE facilities, sites, or organizations be useful?

- ? Yes
- ? No
- ? Not sure

37. Please indicate any specific programs at your facility that you consider to be outstanding and, as such, would be candidates for such a publication.

Facility: ______________________________

Program: ______________________________

Contact Name: ______________________________

Phone Number: ______________________________

Email Address: ______________________________

38. Are you aware that you can write an article and work with the OEAF engineers to get it published in the OEWS?

- ? Yes
- ? No

If you have information for an article please provide the following:

Contact Name: ______________________________

Phone Number: ______________________________

Email address: ______________________________

39. Are you able to access the OEWS electronically on the network or through Internet access?

- ? Yes
- ? No

40. Are you aware that you can perform electronic word searches of all OE Weekly Summaries from the Weekly Summary web page?

    ? Yes
    ? No

    If yes, how often do you use this feature?

    ? Once a week
    ? Once per month
    ? Never
    ? Other/please specify____

41. How useful in your job are the Safety Notices published by the Office of Nuclear Safety?

    ? Very useful
    ? Somewhat useful
    ? Rarely useful
    ? Never useful
    ? Not aware of Safety Notices (Proceed to Question 45)

42. Do the Safety Notices contain sufficient information?

    ? Yes
    ? No

    If no, what information do you feel should be included?

    ____

43. On average, the length of the Safety Notices is:

    ? Too long (Most notices contain extraneous information and take too long to read.)
    ? Acceptable (Most notices contain only pertinent information.)
    ? Too short (Most notices are missing pertinent information.)

44. How easy to understand are the Safety Notices?

    ? Too difficult (The writing is complex; many technical terms are not adequately defined.)
    ? Acceptable (The writing is clear; technical terms are adequately defined.)
    ? Too tedious (The writing is simplistic; too many common technical terms are defined.)

45. What other subjects for Safety or Technical Notices would be useful to your facility?

    ____

46. Would you like to receive the OEWS electronically (usually available the day it goes to print)?

    ? Yes
    ? No

    If yes, please provide the following information:

1998 OEWS READER SURVEY

Name	
Title	
Company	
Street Address	
City, State, Zip	
Phone Number	
Email Address	